



OPERATIONAL PROCEDURES



8 OPERATIONAL PROCEDURES

The FAA develops new operational procedures to implement changes in airspace design or to modify existing structures. New operational procedures can increase airspace capacity with little or no investment in airport infrastructure or equipment. The FAA does this by giving pilots more flexibility in determining their routes, altitude, speed, and departure and landing times.

This chapter describes a number of projects that are under way. Many of these projects will take a number of years to be completed, but nonetheless have an impact on system capacity and efficiency.

8.1 Reduced Oceanic Separation Standards

A fundamental difference between oceanic airspace and airspace over land is that aircraft over the oceans have to be given greater separation from each other because of the absence of radar coverage. The current oceanic air traffic control system uses filed flight plans and position reports to track an aircraft's progress and ensure that separation is maintained. The progress of an aircraft is monitored by air traffic control using position reports sent by the aircraft over high frequency radio. Position reports are infrequent (approximately one per hour). Radio communication is subject to interference, disruption, and delay because radio operators are required to relay messages between pilots and controllers. These deficiencies in communications and surveillance have necessitated larger separation minima.

Reduced separation standards are being implemented over a period of time in different areas of oceanic airspace to take advantage of technological advances that are improving the accuracy and timeliness of position information available to pilots and air traffic controllers. At this time, vertical separation minima are being reduced in both the Atlantic and in the northern Pacific, while horizontal separation minima are being reduced in the Pacific.

8.1.1 Reduced Vertical Separation Minima in the Atlantic and Northern Pacific

Procedures implemented more than 40 years ago require a 1,000-foot minimum vertical separation between IFR aircraft below FL290 and a 2,000-foot separation above FL290. The 2,000-foot separation above FL290 was necessary because the instruments used to display, report, and control aircraft altitude at that time had relatively poor accuracy.

Over the past few years, the FAA, in cooperation with ICAO and international air carriers has begun reducing oceanic vertical separation minima from 2,000 feet to 1,000 feet. The goal of this initiative, called Reduced Vertical Separation Minima (RVSM), is to increase airspace capacity and allow more aircraft to operate at fuel-efficient altitudes. Reducing vertical separation from 2,000 feet to 1,000 feet effectively doubles the number of available routes.

To ensure that aircraft will be able to maintain separation, aircraft that want to participate in RVSM must meet stringent altimetry system standards. Height-keeping performance of participating aircraft is monitored under two main airways, using aircraft radar returns. Aircraft that do not pass through those monitoring areas are evaluated using portable measuring devices.

RVSM is being phased in by altitude and airspace region. It was pioneered in the North Atlantic airspace. Aircraft crossing the North Atlantic fly along a highly organized route structure. Traffic flows primarily westbound from Europe in the morning and eastbound from North America in the evening. RVSM was implemented in the North Atlantic airspace from FL330 to FL370 in 1997 and was expanded to FL310 to FL390 in 1998.

RVSM in the North Atlantic has successfully increased capacity and resulted in user-estimated fuel savings of \$32 million annually. Full implementation of RVSM for FL290 to FL410 should be complete by 2001.

RVSM in the Western Atlantic for FL310 to FL390 will be phased-in starting in 2000, beginning with traffic en route to or from airspace in which RVSM is already in effect. The Western Atlantic route system is a complex web of fixed routes that frequently experience high traffic volume. The heaviest traffic flow is North-South from the United States to Puerto Rico. Preliminary estimates of fuel savings due to RVSM in the Western Atlantic are one to two percent. Full implementation of RVSM in this region is scheduled for 2001.

RVSM was implemented in the Northern Pacific from FL290 to FL390 in 2000. Projected fuel savings for U.S. carriers as a result of RVSM in this region are expected to exceed \$150 million.

8.1.2 Reduced Horizontal Separation Minima in the Pacific

As a result of improved navigational capabilities made possible by technologies such as GPS, TCAS, and controller-to-pilot data link communications, oceanic horizontal separation standards, both lateral and longitudinal, are being reduced.

Oceanic lateral separation standards were reduced from 100 to 50 nautical miles in the Northern and Central Pacific regions in 1998, and in the Central East Pacific in 2000. The FAA intends to extend the 50 nautical mile separation standard to the South Pacific. Flights along the Southern Pacific routes are frequently in excess of 15 hours. As a result, the fuel and time savings resulting from more aircraft flying closer to the ideal wind route in this region are expected to be substantial.

In 1998, longitudinal separation minima were reduced in the Northern Pacific from the time-based standard of 15 minutes to 50 nautical miles. This procedure requires controllers to obtain the aircraft position every 30 minutes. Until enhanced surveillance capabilities are available, this standard will be limited to the Pacific region.

8.2 Increasing Civilian Access to Special Use Airspace

The FAA routinely works with the Department of Defense (DoD) to provide civilian access to special use airspace (SUA) when it is not being used by the military, through agreements concerning civilian access to specific SUA and the development of automated information systems that report on the availability of SUA.

One example is the agreement between the FAA and DoD on civilian access to off-shore SUA along the West coast and the FAA has developed routes that take advantage of the increased access. The Pacific-offshore route, which ranges from San Francisco to San Diego, helps reduce departure delays at San Francisco International Airport. The Point Mugu Oceanic Access Route allows for bi-directional flows from Los Angeles-area airports and direct western access to oceanic airspace. Both of these routes are available at all times unless required for military use. Figure 8-1 shows the Pacific-offshore route.

Figure 8-1

Special Use Airspace Routes
Along the West Coast



Aircraft are normally sent over, under, or around special use airspace. By gaining access to SUA status information, pilots can sometimes avoid these deviations, saving both fuel and time. Increasing access to special use airspace is a key component of Free Flight and an important capacity enhancement.

In cooperation with DoD, the FAA has developed a computer information system, the Special Use Airspace Management System (SAMS) to provide pilots, airlines, and controllers with the latest status information, current and scheduled, on special use airspace. DoD operates a similar system, the Military Airspace Management System (MAMS) to prepare and transmit their schedules to the FAA. The FAA redistributes this information via SAMS.

The Central Altitude Reservation Function (CARF) is another FAA component supporting military operations. SAMS handles schedule information regarding “fixed” or “charted” SUA while CARF handles ad hoc time and altitude reservations. Both subsystems deal with planning and tracking the military’s use of the NAS.

As part of the FAA Spring/Summer Plan, the FAA and the U.S. Navy have signed a letter of agreement regarding civilian use of offshore warning area airspace from Northern Florida to Maine during severe weather events. The letter specifies coordination procedures to ensure that flights may be routed through this airspace when required to circumvent severe weather. To facilitate the use of this airspace, the FAA established waypoints in East Coast-offshore airspace along several routes for conducting point-to-point navigation when the DoD has released that airspace to the FAA. The waypoints take advantage of RNAV capabilities and provide better demarcation of airspace boundaries, resulting in more flexible release of airspace in response to changing weather.

8.3 RNAV Approaches

Global Positioning System navigation is revolutionizing aviation as satellite guidance makes new instrument approaches to many more airports possible. The FAA has developed new terms and standards for instrument approaches grouped under the general category of RNAV to capitalize on GPS capabilities. RNAV approaches increase system safety by allowing more stable descent paths than instrument approaches using traditional ground-based navigational aids and also offer capacity benefits, particularly at airports that did not previously offer instrument approach capability. The FAA is developing RNAV approach procedures at airports across the U.S., and is publishing them in new instrument approach charts intended for all aircraft. The new RNAV instrument approach charts include lateral navigation (LNAV) and lateral navigation/vertical navigation non-precision approaches (LNAV/VNAV).

An LNAV approach is a non-precision approach (no vertical guidance) with a minimum descent altitude of 250 feet above obstacles on the flight path. LNAV approaches can be conducted today with approach-certified GPS receivers. The FAA has developed 2,833 LNAV approaches at general aviation airports, almost forty percent of which are at airports that previously had no straight-in instrument approach capability.

An LNAV/VNAV approach is a vertically-guided approach with a decision altitude down to 350 feet above the runway touchdown point, requiring a Wide Area Augmentation System (WAAS) certified receiver (not yet available) or certain flight management systems (FMS) with barometric VNAV. Visibility requirements are generally one mile at airports without approach lighting systems. The LNAV/VNAV procedure falls between a non-precision approach with no vertical guidance and a true precision approach. It may not have the same level of accuracy, integrity, and continuity as an ILS, but it provides very good vertical guidance, stabilizing the approach. As such, the development of LNAV/VNAV approaches is a strategy to help reduce the risk of controlled flight-into-terrain at airports without an ILS, or when an ILS is out of service. In addition, the development of these approaches at airports that do not currently have an ILS increases access to these airports under low-visibility conditions. The FAA has published 115 LNAV/VNAV approaches.

The new RNAV approach charts will also include precision approaches using WAAS when it becomes operational. WAAS was intended to allow ILS-like CAT I approaches to 200-foot decision altitude and one-half mile visibility at airports with the appropriate lighting systems and runway markings. Although system accuracy has consistently exceeded CAT I standards in recent tests, system integrity has not yet met certification standards. Integrity describes the system's ability to detect a problem with the navigation signal and warn the pilot quickly.

It is unclear when WAAS will be able to provide CAT I capabilities, but WAAS is expected to deliver LNAV/VNAV approaches to the majority of U.S. airports by 2002. The availability of LNAV/VNAV approaches made possible by WAAS will greatly increase safety and access at smaller airports that do not have instrument approaches with vertical guidance.

8.4 Removal of 250-Knot Speed Limit

Aircraft are currently restricted to a speed of 250 knots below 10,000 MSL, which limits departure rates from busy terminal areas. In 1997, the FAA conducted a field test for departures from Houston Class B airspace to evaluate the impact of removing the 250-knot speed limit. The results of the test were generally positive. The majority of pilots and controllers who were interviewed supported the concept and the surrounding communities perceived no noise impact from removing the speed limit. However, removing the speed limit appeared to result in an increase in the number of aircraft exiting Class B airspace below 10,000 feet, raising the possibility of increased risk of collision with uncontrolled traffic passing just outside of the Class B airspace.

An analysis of radar tracks of flights involved in the field test revealed that older aircraft were more likely to exit the Class B airspace prior to reaching 10,000 feet. Subsequent tests revealed that appropriate pilot techniques, such as use of higher power settings and reconfiguration of the aircraft allowed flights to reach 10,000 feet prior to exiting Class B airspace at speeds up to 300 knots.

A determination of required pilot training, system modifications, and further analysis must be made before implementing the procedure at additional airports. Possible system modifications include establishing climb corridors in high-density traffic areas and annotating departure procedures to describe the actions required to ensure that aircraft reach 10,000 feet prior to exiting the Class B airspace.

8.5 Simultaneous Offset Instrument Approaches

A combination of technology and procedures called Simultaneous Offset Instrument Approaches (SOIA) has the potential to increase capacity at airports with closely spaced parallel runways. Using a precision runway monitor (PRM) and an offset ILS localizer and glide slope, SOIA can safely reduce approach minima from 3,500 to 1,600 feet and visibility minima from five to four miles.

Using a SOIA, the pilot on the offset approach would fly a straight-but-angled approach until descending below the cloud cover. At that point, the pilot would have a period of time to visually acquire the traffic on the other approach before continuing to the runway. If the pilot does not see the other aircraft before reaching the missed approach point, the approach must be discontinued.

SFO is the first candidate airport for SOIA. SFO has purchased a PRM, which is expected to be operational by late 2001. At SFO the arrival rate is 60 aircraft per hour in clear weather, using both parallel runways, which are 750 feet apart. In low-ceiling conditions, simultaneous visual conditions cannot be conducted. Aircraft are placed in-trail to one runway, reducing the airport arrival rate by half. SOIA would allow the airport to increase its airport acceptance rate during adverse weather to 38-45 aircraft per hour. Other potential sites for SOIA include St. Louis and Newark airports.

An evaluation of the flyability of the SOIA procedure conducted in July 1999 concluded that the procedure meets the design criteria for flyability and that the collision risk between the two aircraft was negligible. The FAA is now evaluating wake vortex issues and determining how the procedure could be modified to minimize risk of a wake vortex-related incident.

8.6 Increased Use of Land and Hold Short Operations

More than 30 years ago, the FAA began allowing simultaneous operations on intersecting runways, under restricted conditions, at a number of U.S. airports. Using this procedure, an air traffic controller could clear an aircraft to land and stop before a designated “hold short” point to allow another aircraft to take off or land on the intersecting runway. This procedure increases airport acceptance rates by capitalizing on the fact that the full runway length is not necessarily required for an aircraft landing.

In 1997, the procedure was expanded to include landing and holding short of an intersecting taxiway, approach/departure flight path, or predetermined point on the runway other than a runway or taxiway, under the designation land-and-hold-short operations (LAHSO). The pilot-in-command has the final authority to accept and decline any LAHSO clearance.

In February 1999, the FAA, in coordination with the Air Transport Association (ATA) and the Air Line Pilots Association (ALPA), made a number of changes to the LAHSO procedure, such as limiting LAHSO to dry runway conditions. In August 2000, the FAA issued revised standards containing three additional substantive changes. First, the means of determining the minimum available landing distance was modified so that the longest-possible landing distance plus an additional safety margin will be used to determine whether LAHSO can be conducted for a given aircraft at a specific runway. Next, the new standards allow participation in LAHSO only by pilots who have been adequately trained in the maneuver. While most air carrier pilots have already been trained in LAHSO, the FAA will ensure that the remaining air carrier pilots, and GA and foreign carrier pilots, receive adequate training. Mixed U.S. air carrier/GA/foreign operations will be permitted only when adequate pilot training is accomplished. Also, no LAHSO will be conducted on runways that require a rejected landing procedure until the procedure has been scientifically modeled and verified.

This last requirement will have a noticeable adverse impact on capacity, at least temporarily, at certain large airports. At the 19 largest U.S. airports, 39 intersecting runways where LAHSO was previously conducted require a rejected landing procedure. For example, previously about a quarter of Chicago O'Hare's daily operations were conducted on two intersecting runways (14R and 27L) in rapid succession when weather conditions permitted. Arriving planes on runway 14R stopped short of the intersection when an aircraft was departing on runway 27L. Because it requires a special rejected landing procedure, LAHSO will not be available for this particular runway combination until the procedure has been modeled and verified, which will reduce daily operations at Chicago O'Hare by approximately ten percent. Other airports where the new rejected landing procedure requirement will have a significant impact on capacity include Boston, Philadelphia, and St. Louis. Figure 8-2 illustrates the LAHSO procedure for an intersecting runway, taxiway, or pre-determined point on the runway.

Figure 8-2**LAHSO Takeoff and Landing Procedures**